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THE STUDY OF COMPARISON OF SINGLE-INCISION LAPAROSCOPIC VERSUS CONVENTIONAL LAPAROSCOPIC APPENDECTOMY: A COMPREHENSIVE SYSTEMATIC REVIEW

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ABSTRACT

Background: *Acute appendicitis is highly prevalent in children with an acute abdomen, and appendectomy is still the main method of treatment for this disease. The standard treatments for acute appendicitis are early open surgery and laparoscopic surgery.*

The aim: *The aim of this study to show about comparison of single incision laparoscopic versus conventional laparoscopic appendectomy.*

Methods: *By the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. This search approach, publications that came out between 2014 and 2024 were taken into account. Several different online reference sources, like Pubmed, SagePub, and Sciencedirect were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *Eight publications were found to be directly related to our ongoing systematic examination after a rigorous three-level screening approach. Subsequently, a comprehensive analysis of the complete text was conducted, and additional scrutiny was given to these articles.*

Conclusion: *HLA has a negative impact on quality of life and aesthetics because it requires three surgical incisions. On the contrary, in single-incision transumbilical laparoscopic appendicectomy (SILA), the incision is made around the umbilicus.*

Keyword: *Appendicitis, appendectomy, laparoscopy, treatment.*

INTRODUCTION

Acute appendicitis is one of the most common abdominal surgical emergencies, and conventional three-access laparoscopic appendectomy (CLA) is currently the gold standard treatment. However, an alternative surgical approach, Single-Port Laparoscopic Appendectomy (SILA), has been proposed recently. SILA aims to improve aesthetics, reduce postoperative pain and hospital stay, and thus lead to a faster return to work and improved quality of life. Potential disadvantages of SILA include loss of triangulation, impaired vision, intra/extra abdominal instrument conflicts, and device cost.[1–3]

Acute appendicitis is one of the most common causes of emergency gastrointestinal surgery worldwide. Even though controversy regarding the medical management of acute appendicitis using antibiotics exists, appendectomy is currently considered the gold standard treatment. Open appendectomy rather than laparoscopic appendectomy was performed universally until the 1990s, even though Kurt Semm, a German gynecologist, first introduced laparoscopic appendectomy firstly in 1983. Currently, most appendectomies are laparoscopic because of the advantages including early recovery, less pain, and improved cosmetic satisfaction compared with open appendectomy.[4]

A conventional laparoscopic appendectomy (CLA) usually requires insertion of three port trocars with two working ports and one camera port. Additionally, single-incision laparoscopic appendectomy (SILA) has become popular since it was first introduced in 1992. Recent meta-analysis reported that SILA is a safe and feasible procedure compare to CLA, though SILA is a considered more technically demanding than CLA.[4–6]

Compared with OA, CLA has the merits of precise diagnosis, minimal trauma, less pain, quick recovery, less bleeding, fewer complications and a reduced duration of hospitalization. However, a previous study has reported that CLA has a greater surgical duration than OA, a high cost and provides no significant advantage for the recovery of patients.[7–9]

Laparoscopic surgery through a single incision has evolved with the objectives of minimizing surgical trauma, reducing postoperative pain, shortening convalescence, and providing improved cosmesis. Recent meta-analyses of single-incision laparoscopic cholecystectomy have demonstrated similar complication rates to conventional laparoscopy, but they have failed to provide uniform results regarding pain. Emerging evidence suggests that the appealing idea of minimizing surgical trauma must be weighed against associated direct and indirect risks.[9–11]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

CRITERIA FOR ELIGIBILITY

For the purpose of this literature review, we compare and contrast comparison of single incision laparoscopic versus conventional laparoscopic appendectomy. It is possible to accomplish this by researching of comparison of single incision laparoscopic versus conventional laparoscopic appendectomy. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about comparison of single incision laparoscopic versus conventional laparoscopic appendectomy. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2014, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

SEARCH STRATEGY

We used "comparison of single incision laparoscopic versus conventional laparoscopic appendectomy." as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases by inputting the words: *(("*Appendectomy*"[MeSH Subheading] OR " Children"[All Fields] OR "*Laparoscopy*" [All Fields]) AND ("*Incision*"[All Fields] OR "* conventional*"[All Fields]) AND ("*Management*"[All Fields]) OR ("*Oucomest*" [All Fields]))* used in searching the literature.

DATA RETRIEVAL

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources

for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and cannot have been seen anywhere else.

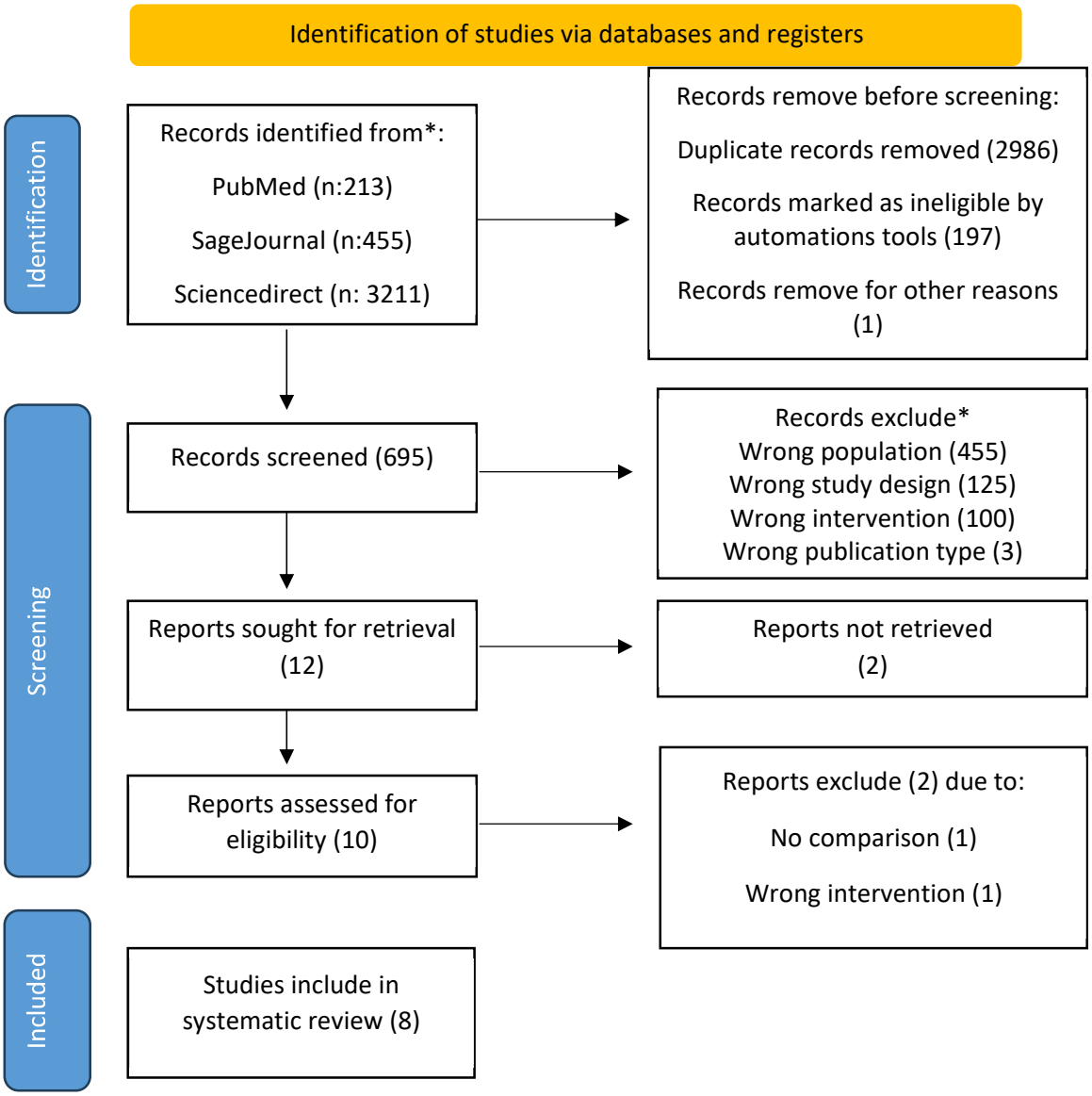

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

QUALITY ASSESSMENT AND DATA SYNTHESIS

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

Using reputable resources like Science Direct, PubMed, and SagePub, our research team first gathered 3879 publications. A thorough three-level screening strategy was used to identify only five papers as directly relevant to our ongoing

systematic evaluation. Next, a thorough study of the entire text and further examination of these articles were selected. Table 1 compiles the literature that was analyzed for this analysis in order to make it easier to view.

Table 1. The litelature include in this study

Basukala, S et al., 2023[12]	Nepal	retrospective cohort study was done at Shree Birendra Hospital from January 2018 to December 2021, with a total study population of 450 participants (300 in open appendectomy and 150 in laparoscopic appendectomy). Preoperative. Intraoperative and postoperative parameters were compared and analyzed between two groups using SPSS-25.	450	The mean age was 26.72 ± 9.70 in the open appendectomy (OA) and years 23.89 ± 6.32 in the laparoscopic appendectomy (LA) group. ($p = 0.010$) There was a significant difference between the mean operative time (46.08 ± 13.10 min in OA and 56.86 ± 11.70 min in LA, $p = 0.000$), length of hospital stay (1.28 ± 0.80 days in OA and 1.07 ± 0.25 days in LA, $p = 0.000$), course of oral analgesics (3.55 ± 0.68 days in OA and 3.00 days in LA $p = 0.000$) between OA groups and LA groups, while the total number of complications was less in the LA group however there was no statistically significant difference postoperative complications ($p = 0.124$) between the two groups in the surgical findings.
Liu, J et al., 2023[13]	China	The clinical data of children (<14 years old) who underwent laparoscopic appendectomy at Yijishan Hospital of Wannan Medical College, Hubei Provincial Maternal Health Hospital and Qingdao Women and Children's Medical Center from January 2019 to June 2022 were retrospectively analyzed.	599	In this study, the data of 588 patients, including 385 patients in the THLA group and 203 patients in the SILA group were collected. The baseline characteristics between the two groups of patients before surgery were comparable. There was no significant difference in the average operation time between the THLA group and the SILA group (56.31 ± 1.83 min vs. 57.48 ± 1.15 min, $P > 0.05$). There was also no significant difference in the average length of hospital stay between the THLA group and the SILA group (6.91 ± 0.24 days vs. 7.16 ± 0.36 days, $P > 0.05$). However, the FLACC scores of the SILA group (3.71 ± 0.78) were significantly lower than those of the THLA group (3.99 ± 0.56) on the second postoperative day, and the difference was significant ($P < 0.05$). The score of the questionnaire evaluating cosmetic appearance of the postoperative abdomen was

				significantly higher in the SILA group (15.81 ± 0.36) than in the THLA group (13.10 ± 0.24) ($P < 0.05$). There was no significant difference in the incidence of postoperative complications between the two groups ($P > 0.05$).
Zhang, N et al., 2022[14]	China	Between January 2020 and December 2021,a total of 120 adult patients with acute appendicitis were randomized to the BASPLA group (62 cases) and the CLA group (58 cases).	120	There was no significant difference in patients' pain scores before operation ($p = 0.68$) and after operation ($p = 0.81$) and patient-reported cosmetic scores ($p = 0.43$) between the two groups. Operation time in the BASPLA group was longer than that in the CLA group ($p<0.001$). There were no significant differences in the conversion rate ($p = 0.94$), analgesics required before ($p = 0.91$) and after the operation ($p = 0.78$), intraoperative bleeding ($p = 0.53$), recovery of bowel movement time ($p = 0.26$), hospital stay ($p = 0.06$), and complication rate ($p = 0.84$) between the two groups.
Wu, S et al., 2022[15]	China	This retrospective study included 174 patients who underwent CLA, TSILA, or SSILA for acute appendicitis at our hospital between June 2019 and July 2021. Demographic data and clinical outcomes were compared among the three groups.	174	Compared with CLA, TSILA was associated with significant reductions in postoperative pain, length of hospital stay, and hospital cost, while SSILA was associated with significant reductions in length of hospital stay and hospital cost (all $P < 0.05$). Significantly more patients in the two SILA groups were cosmetically satisfied than those in the CLA group (all $P < 0.05$). However, compared with CLA, SSILA required a significantly longer operative time (65.3 ± 24.1 vs 56.5 ± 20.9, $P = 0.039$). Besides, compared with TSILA, SSILA showed significantly higher postoperative pain score (2 ± 2 vs 3 ± 2, $P = 0.006$). Mild incisional or intraabdominal infections were noticed in 2 (3.0%) patients in the CLA group, 3 (5.1%) in the TSILA group, and 3 (6.3%) in the SSILA group ($P = 0.69$).
Muneef, A et al., 2020[16]	India	A total of 80 patients with appendicitis were recruited and underwent SILACIG	80	There was no significant difference between SILACIG and CMLA in terms of the time of oral intake, day of discharge, and return to work. Operative time was significantly more in

		(n=40) and CMLA (n=40). They were monitored for operative time, time of oral intake, pain on the second postoperative day, day of discharge, return to work, and scar size after two months.		the SILACIG group as compared to CMLA. Pain on the second postoperative day was less than CMLA, and the size of the operative scar was significantly smaller than 2 cm in the SILACIG group as compared to the CMLA group.
Kim, JH et al., 2015[17]	Republic of Korea	A total of 2587 patients (1208 SIL-A and 1379 CL-A) who underwent laparoscopic appendectomy from May 2008 to April 2013 were studied retrospectively. The clinical characteristics and short-term operative outcomes of these patients were reviewed and analyzed.	2587	There were more simple type appendicitis in the SIL-A group and more complicated type appendicitis in CL-A group (81.0% vs 74.7% and 19% vs 25.3%, P <0.001, respectively). The operative time (minutes) was similar between the 2 groups (40.1± 18.6 vs 38.8 ± 25.2, P ¼ 0.154). However, on subgroup analysis, operative time for simple type appendicitis was longer in the SIL-A group (36.6 ± 14.9 vs 32.3± 18.3, p < 0.001). The superficial incisional surgical site infection rate was higher in the SIL-A group (4.4% vs 2.3%, P ¼ 0.003). The readmission rate was higher in the CL-A group (0.8% vs 1.7%, P ¼ 0.042). The superficial incisional surgical site infection rate was higher in the SIL-A group (4.4% vs 2.3%, P = 0.003). The readmission rate was higher in the CL-A group (0.8% vs 1.7%, P = 0.042). The postoperative hospital stay (days) was shorter in the SIL-A group (3.05 ± 1.97 vs 3.35 ± 2.14, P < 0.001).
Liang, HH et al., 2014[18]	Taiwan	We retrospectively reviewed the cases of consecutive patients with appendicitis and compared those who underwent conventional laparoscopic appendectomy (CLA) performed using 3	688	Our analysis included 688 consecutive patients: 618 who underwent CLA and 70 who underwent SILA. Postsurgical complications occurred more frequently in the CLA than the SILA group (18.1% v. 7.1%, $p = 0.018$). Patients who underwent SILA returned to oral feeding sooner than those who underwent CLA (median 12 h v. 22 h, $p < 0.001$). These between-group differences remained significant after controlling for other factors. Direct comparison of only

		incisions and those who underwent single-incision laparoscopic appendectomy (SILA). During SILA, the single port was prepared to increase visibility of the operative site.		nonperforated cases, which was determined by pathological examination, revealed that SILA was significantly longer than CLA (60 min v. 50 min, $p < 0.001$). Patients who underwent SILA had longer in-hospital stays than those who underwent CLA (72 v. 55 h, $p < 0.001$); however, they had significantly fewer complications (3.0% v. 14.4%, $p = 0.006$).
Joliat, GR et al., 2014[19]	Switzerland	From February 2011 to December 2011, single-incision laparoscopic appendectomy was proposed to patients admitted to the emergency room of the University Hospital of Lausanne (CHUV, Lausanne, Switzerland), diagnosed with uncomplicated acute appendicitis.	80	No statistically significant differences for median operation time, length of hospital stay, complication rate, and need for postoperative antibiotherapy were found. In 5 out of 20 single-incision laparoscopic appendectomy patients the Endoloop® Ligature was judged difficult to put in place.

Basukala, S et al., 2023 showed the laparoscopic approach is a better option for uncomplicated appendicitis due to its less postoperative pain and shorter duration of hospital stay.[12]

Liu, J et al., 2023 showed SILA is more advantageous in terms of postoperative FLACC scores and cosmetic appearance in children than THLA. There was no significant difference in the incidence of complications or other aspects between the two surgical methods.[13]

Zhang, N et al., 2022 showed BASPLA for adult acute appendicitis can be a substitute for CLA, BASPLA is comparable to CLA in postoperative pain and quality of life. Compared to surgical assistants, it not only provides a stable, clear image for the surgeon but also frees up personnel. Especially in emergency surgery, it can achieve satisfactory clinical efficacy without requiring an assistant.[14]

Wu, S et al., 2022 showed SILA performed with only conventional laparoscopic instruments was associated with reduced hospital stay and cost and higher cosmetic satisfaction in comparison to CLA. However, it is technically demanding and may increase operative time.[15]

Muneef, A et al., 2020 showed SILACIG is a feasible, safe, and cost-effective technique. It is comparable with CMLA in terms of preoperative diagnosis, postoperative oral intake, hospitalization period, and return to work. It shows less pain on the second postoperative day and cosmetic benefit but requires more operative time than CMLA.[16]

Kim, JH et al., 2015 showed In this study, SIL-Awas technically feasible and safe option for appendicitis. The SIL-A group had more favorable outcomes such as shorter time to start diet and less hospital stay after surgery than the CL-A group. However, superficial incisional surgical site infection rate was higher in the SIL-A group than in the CL-A group, an effort to reduce superficial incisional SSI should be made.[17]

Liang, HH et al., 2014 showed In addition to its cosmetic advantages, SILA led to rapid recovery and no increase in postsurgical pain or complications.[18]

Joliat, GR et al., 2014 showed single-incision laparoscopic appendectomy is a feasible and effective operative technique for uncomplicated acute appendicitis.[19]

DISCUSSION

Acute appendicitis is a major health issue worldwide, and in particular, the coronavirus disease 2019 pandemic has been associated with a significant increase in the proportion of patients with complicated appendicitis. Although the roles of medical or surgical interventions remain controversial, early surgery is considered an effective option and has been widely adopted. With socioeconomic development and increasing demands on cosmetic appearance and minimally-invasive surgery, more minimally-invasive surgical procedures (e.g., endoscopic surgeries) without creating an incision in the abdominal wall, have emerged. However, their applications have been limited due to the high levels of operating difficulties and equipment requirements, and long learning curves.[9,20,21]

In contrast, since George Kelling described laparoscopy in 1901, laparoscopic surgery has been increasingly applied in clinical settings due to its relatively simple operation, short learning curve, and feasibility for comprehensive abdominal exploration. Compared with the traditional three-port approach, single-port laparoscopy has been confirmed to be effective and safe in the treatment of acute appendicitis, along with many other advantages, including less trauma, less pain, shorter hospital stay, and improved cosmetic effect.[18,20,22]

Conventional laparoscopic appendectomy (CLA) using three port incisions is accepted as the standard technique for patients with acute appendicitis. CLA has been shown to have several advantages over an open approach, including less surgical trauma, faster recovery, decreased complications, less postoperative pain, and improved cosmetic outcomes. Although the results of CLA are already excellent, surgeons have sought to develop techniques to further reduce surgical trauma and to improve cosmetic outcomes for patients. Therefore, as single-site access laparoscopic procedures have become a rapidly evolving trend in the surgical field, single-incision laparoscopic appendectomy (SILA) has recently gained popularity as a treatment for acute appendicitis.[23–25]

CONCLUSION

HLA has a negative impact on quality of life and aesthetics because it requires three surgical incisions. On the contrary, in single-incision transumbilical laparoscopic appendicectomy (SILA), the incision is made around the umbilicus. Because the surgical incision is made around the umbilicus, it is very concealed and could be perceived as a natural scar, thereby achieving good cosmetic results.

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